PURDUE UNIVERSITY

School of Mechanical Engineering
Purdue University
585 Purdue Mall
West Lafayette, IN 47907-2088

2020

HAWKINS

Memorial Lecture in Heat Transfer

Tuesday, **March 23, 2021**
12:30 p.m., **https://purdue-edu.zoom.us/j/97883548935**
Reception & Student Poster Session at 1 p.m. Thursday March 25
https://gather.town/app/dnipV9nNHqnrv2Qr/PUMechanicalEngineering

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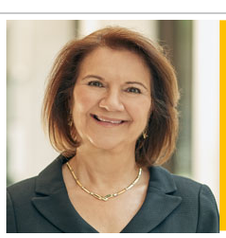

Cristina Amon

MULTISCALE HIERARCHICAL THERMAL MODELING OF ELECTRIC VEHICLES

Alumni Distinguished Professor in Bioengineering

Mechanical and Industrial Engineering, University of Toronto

Advanced Thermofluids Optimization, Modelling, and Simulation (ATOMS) Laboratory

CRISTINA AMON

Cristina Amon is Alumni Distinguished Professor and Dean Emerita of the Faculty of Applied Science and Engineering at the University of Toronto. Prior to joining U of T in 2006, she was the Raymond J. Lane Distinguished Professor and Director of the Institute for Complex Engineered at Carnegie Mellon University. She has pioneered the field of Computational Fluid Dynamics and the development of multidisciplinary multi-scale hierarchical modelling, concurrent design and optimization methodologies for thermo-fluid transport phenomena, with applications to thermal management of electronics and electric vehicles, renewable energy and biomedical devices.

Professor Amon is a fellow of all major professional societies in her field and has contributed over 400 refereed articles to the education and research literature. She was appointed to the Order of Canada and inducted into the Canadian Academy of Engineering, Hispanic Engineer Hall of Fame, Royal Society of Canada, Spanish Royal Academy and US National Academy of Engineering.

Among her many accolades, she received the ASEE Westinghouse Medal, ASEE Ralph Coats Roe Award, ASME Heat Transfer Memorial Award, ASME InterPACK Achievement Award, EIC Sir John Kennedy Medal, and CSME Robert W. Angus Medal. She was recognized as one of Canada's Most Influential Women in 2012, the Powerful Women Trailblazers & Trendsetters in 2019, and received the highest honor for Engineers in Canada (2020 Engineers Canada Gold Medal) and Ontario (2015 PEO Gold Medal) for outstanding engineering public service, technical excellence and professional leadership.

Cristina Amon is the founding chair of the Global Engineering Deans Council and has served on numerous editorial and technical conference roles, advisory and review boards in North America and abroad. She received her Mechanical Engineering degree from Simon Bolivar University in Venezuela, and her M.S. and Sc.D. from the Massachusetts Institute of Technology.

MULTISCALE HIERARCHICAL THERMAL MODELING OF ELECTRIC VEHICLES

The next battery technology leap relies on novel thermal management strategies and packaging architectures, realized as intelligent battery thermal management systems (BTMS), which can optimally control the thermo-electrochemical phenomena occurring inside the batteries to maximize performance, minimize degradation, enable fast-charging protocols, and permit a seamless transition of degraded electric vehicle (EV) batteries into less-demanding second-life stationary systems. This presentation will address current engineering challenges and opportunities on EV thermal management, with a focus on our research on multiscale hierarchical design, modelling, and optimization approaches to overcome cooling and heating challenges across multiple physical domains, length and time scales; from battery electrodes, to battery cells, to battery packs, to EV thermal management systems. This presentation will provide a scale-bridging perspective across the following subjects: (i) sub-continuum modelling and thermal engineering of electrode materials for metal-ion batteries, (ii) characterization of anisotropic thermophysical properties and spatially distributed heat generation rates in battery cells, (iii) high-fidelity thermo-electrochemical modelling and simulations of battery cells and modules, and (iv) reduced-order performance-degradation models of battery packs and EV thermal management systems that enable thermally-safe fast charging and temperature-modulated battery life extension.

GEORGE A. HAWKINS

The Hawkins Memorial Lecture in Heat Transfer was established in 1984 to honor the memory of George A. Hawkins, former dean of the College of Engineering. Renowned for his many contributions as a teacher, researcher, and administrator, he retained a strong commitment to heat transfer and was instrumental in establishing Purdue's eminence in the field. The lecture series provides an opportunity for a leader in heat transfer research to present topics of broad interest to the University community. This series is supported by an endowment created with gifts from the Heat Transfer Area faculty at Purdue.

Hawkins Memorial Lecture Series

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1985 E. M. Sparrow • University of Minnesota
1986 Arthur E. Bergles • Iowa State University
1987 Chang-Lin Tien • University of California—Berkeley
1988 Wataru Nakayama • Hitachi, Ltd.
1989 Franz Mayinger • Technische Universität München
1990 Raymond Viskanta • Purdue University
1991 R. J. Goldstein • University of Minnesota
1992 Richard C. Chu • International Business Machines Corporation
1993 Robert Siegel • NASA Lewis Research Center
1994 Julian Szekely • Massachusetts Institute of Technology
1995 John R. Howell • University of Texas—Austin
1996 Frank P. Incropera • Purdue University
1997 Boris Rubinsky • University of California—Berkeley 1998 David P. DeWitt • Purdue University
1999 Vijay K. Dhir • University of California—Los Angeles
2000 Robert G. Watts • Tulane University
2001 Martin C. Jischke • Purdue University
2002 Kenneth R. Diller • University of Texas-Austin
2003 John H. Sununu • JHS Associates, Ltd.
2004 Dimos Poulikakos • ETH Zurich
2005 Massoud Kaviany • University of Michigan—Ann Arbor
2006 Yogesh Jaluria • Rutgers, The State University of New Jersey

2007 Richard O. Buckius • University of Illinois at Urbana-Champaign 2008 Paul Hommert • Sandia National Laboratories
2009 Mamoru Ishii • Purdue University
2010 Chung K (Ed) Law • Princeton University
2012 Gang Chen • Massachusette Institute of Technology 2013 Jayathi Murthy • Purdue University

2014 Jean-Jacques Greffet • Institute Optique Palaiseau-France
2015 Kenneth E. Goodson • Stanford University
2016 Suhas V. Patankar • University of Minnesota
2017 Mehmet Toner • Harvard Medical School
2018 Costos Grigoropoulos • University of California, Berkeley
2019 Cynthia Hipwell • Texas A&M University
2020 Cristina Amon • University of Toronto